Form ESA-B4. Summary Report for ESA-147-2
Public Report - Final

Company	General Motors	**ESA Dates**	10/9/07 to 10/11/07
Plant	Tonawanda, NY Engine Plant	**ESA Type**	Pumping Systems
Product	Engine Manufacturer	**ESA Specialist**	Steve Bolles
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ENERGY SAVINGS OPPORTUNITY SUMMARY INFORMATION			
Identified Opportunity	**kWh**	**Fuel Type**	**N,M, L**
Adjust PRV in Mill Water System to reduce recirculation.	493,877	Electric	N
Replace air compressor cooling pump with more efficient unit.	206,122	Electric	M
TOTAL	**699,999**		

IDENTIFIED PLANT BEST PRACTICES	
Plant has Achieved Landfill-Free Status	The facility is the second GM plant in the United Stated to achieve landfill-free status in its manufacturing operations.
Energy Saving Achievements	The plant has reduced its energy use by more than 30% since 2001 as part of GM's global strategy and received the Energy Star Performer Award in 2005.

Brief Narrative Summary Report for the Energy Savings Assessment:

Introduction:

The General Motor's Tonawanda Engine Plant is located in Tonawanda, New York. This facility is approximately 3.1 million square feet of manufacturing operations.

Objective of ESA:

The goal of the ESA was to apply the PSAT program, associated screening, measurement, and analysis methodologies to several pumping systems in order to:

a) Train plant personnel on the use of the DOE tools and methods
b) Identify savings potential in the selected systems and perform a preliminary evaluation of the cost-effectiveness of implementing projects to reduce energy consumption.

Focus of Assessment:

Before starting the assessment, the pump specialist and facility staff reviewed facility pump systems to determine which pumps would be the best candidates for improvement. Pump systems considered included:

a) 500 hp mill water supply pumps
b) 350 hp Archimedes CPI screw pumps
c) 100 hp air compressor cooling pump
d) L-8 50 Coolant Pumps

Based on discussions with staff, the mill water and air compressor cooling pumps were chosen as the best pump systems to review.

Approach for ESA:

Specific Approach

Mill Water Pump System

The mill water system consists of three 500 hp electric and two 550 hp natural gas pumps that draws water from the Niagara River and distributes it throughout the plant for fire protection, cooling and general plant water use.

Pump suction pressure was estimated based on river water level. Discharge pressure was determined from multiple discharge pressure gauges. Power measurements were taken from panel mounted power meters for each of the electric pumps. Distribution flow was determined from existing flow meters on the pump discharge (hourly data indicated that flow readings did not appear to be accurate at times). Re-circulated flow was determined using a Panametrics PT 878 ultrasonic flow meter. The data was entered into the PSAT software tool to determine existing pump efficiency and evaluate potential system improvements.

Air Compressor Cooling Water Pump

The air compressor cooling water pump is used to circulate a glycol/water mix through multiple air compressors and plate and frame heat exchangers. Mill water is directed through the cooling side of the heat exchangers and discharged to the storm sewer.

Power measurements were taken at the pump panel using a Fluke 43 B power quality analyzer. Pump suction and discharge pressures were determined from existing pressure gauges. Distribution flow was determined with the Panametrics PT 878 ultrasonic flow meter. The data was entered into the PSAT software tool to determine existing pump efficiency and evaluate potential system improvements

General Observations of Potential Opportunities:

General comments and observations

The plant staff was very knowledgeable and helpful during the ESA.

Specific opportunities observed

Mill Water Pumps

This pump system had several issues that included:

- Substantial pressure drop from the pump outlet (105 psi) to the end use (as low as 55 psi at one building).
- Pump on/off activated was controlled manually since the pumps did not respond well to automatic operation.
- Flow re-circulated to suction well on a regular basis.
- Cross connection made it difficult to determine total flow from pumps.
- Large 500 hp pumps are medium voltage (variable speed drives would be expensive).
- Two 550 hp natural gas pumps are used in parallel with the three electric pumps.
- End use flow could be reduced substantially through the use of circulating cooling systems such as cooling towers. This would also reduce flow to the wastewater system.

To evaluate the pump system, we collected hourly pressure, flow and energy data over a 12 month period. Although it was difficult to determine how much flow was coming from each pump when multiple pumps were in operation, we developed several equations to give us approximate values. After this analysis was completed, we found that the flow readings appeared to be inconsistent for some head conditions. Although the inaccurate flow readings did not allow us to develop a flow profile to improve initial savings estimates we were able to summarize other relevant system characteristics that included:

- Average annual recirculation flow through the PRV was estimated to be 400 gpm based on historical valve position data and instantaneous flow measured with portable flow meter to develop relationship with valve position.
- Total electric pump hours was approximately 8800 hours (this includes times when two pumps were operated in parallel and other times when only natural gas pumps were used to maintain flow)
- Total flow produced over 12 months was estimated to be 3075 million gallons. Since flow accuracy was questionable, this was only used as a relative value for comparison purposes.

To improve system efficiency and reliability we recommend installing a cross connection with remote venturi type flow meters, remote pressure transducers. Specific improvements include:

- Installation of new venture type flow meters will provide accurate flow measurements (existing pitot tube flow meters are not intended for permanent installation in this environment and may be partially clogged)
- Install pressure transducers away from pumps to prevent excessive pump cycling.
- Install cross connection to improve reliability by allowing North or South line to be taken out of service without interrupting flow.

To reduce energy costs, we have recommended the following improvements:

- Conduct water use audit to determine if flow/pressure can be reduced for “end use” systems. (*If and went American Axle Manufacturing cease operations at this facility, overall system pressure can then be reduced by 10 psi)*
- Set PRV to higher pressure value to reduce recirculation flow (*Note: This item has already been field completed*)
- Monitor pump system data monthly (*Note: This practice already in progress*).
- Automate pump on/off controls based on system demands (*Note: The automation process has been field completed)*

***Note: Originally, this assessment recommended that a cleaning process commonly referred to as "pigging" process be used on the 24" and 16" distribution piping. However, due to the age and sensitivity of the pipe (under the NY State thruway), the cost and risk outweigh the benefit. Consequently, this recommendation will not be implemented.*

Air Compressor Cooling Pump

The air compressor cooling water pump is used to circulate a glycol/water mix through multiple air compressors and plate and frame heat exchangers. Flow, pressure and kW measurements indicated that the pump was not operating efficiently (PSAT grade of 69). With a calculated pump efficiency of 61%, we first reviewed the existing pump curve to see if the pump could be rebuilt to achieve a higher efficiency value. Based on the curve data, it appeared that restoring the pump to "new condition" would improve efficiency to 80%. However, a more realistic value would be several points below this value (we have estimated 77%). From the PSAT results, we would expect a new pump matched to the system conditions would achieve an 88% efficiency value. Based on these values, a new pump would reduce annual energy consumption by approximately 206,000 kwhrs. *Note: A third party, (Ingersol Rand (IR)) controls the operation of the compressed air house. IR is changing out one of these pumps in 2009 and plans on changing the one pump according to this recommendation. The other pump will be replaced in a similar fashion at the End Of Life*.

Other Opportunities

To realize additional energy savings, we also recommend reviewing cost/1000 gallons pumped between the electric and natural gas mill water pumps and adjusting operating hours to use the most cost effective units. In addition, we feel that a detailed water audit that includes a review of water re-use technologies such as closed loop cooling towers will provide a cost savings impact that will not only reduce mill water pump energy use, but will also reduce screw pump (350 hp motors) energy use and treatment costs at the wastewater facility.

Note: If and when American Axle Manufacturing ceases operation at this facility, it will drastically change operating conditions at GM Tonawanda. We will re-assess this opportunity/situation at that time.

Management and UAW Support and Comments:
A corporate level management team and the UAW/WFG Joint Task Team encourage any effort that reduces the Energy usage at all of its plants located around the country. General Motors has a target to reduce energy use and costs by 6% this year. They have an Energy Engineer with this assignment at each facility.

The UAW/WFG Joint Task Teams have identified several Department of Energy (DOE) best practices that will have a significant impact if implemented at GM Facilities. Due to the focus of the Best Practices there is an opportunity for our UAW Skilled Trades to provide a substantial cost savings impact to the operating costs of our facilities by working jointly with the GM/WFG management organization.

UAW/WFG Joint Task Team, DOE associated Best Practices:
BMES-01 Pumping System Assessment Tool
BMES-02 Air Master + Diagnostic Tool
BMES-03 Motor Master + Diagnostic Tool
BMES-04 Steam System Assessment Tool
BMES-07 Fan system Assessment Tool
BMES-09 Chilled Water System Assessment Tool

The UAW Skilled Trades working in conjunction with the GM/WFG Energy & Utilities Services Group (EUSG) and the GM/WFG Facilities Management Group (FM) can jointly pursue the effort to optimize the operating efficiencies of these major systems that are found in GM facilities.

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